

## Teacher's Guide

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# Your Body MUSCULAR AND SKELETAL SYSTEMS

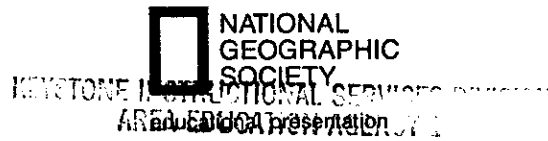
(Sound-color video; 16 minutes)

### SYNOPSIS

Far from being an inert, even "dead" organ system, our skeleton is very active, very alive. It grows with us and repairs and renews itself throughout our lifetime. It is the principal repository for the source of calcium in our body and the site of cell production and growth. Our skeleton provides the framework for our body and protects our internal organs. Our joints and muscles enable us to move that framework in an amazing variety of ways.

*Your Body: Muscular and Skeletal Systems* follows a science teacher as he explains these systems to his young students. Using a model skeleton, the teacher demonstrates the action of hinge, pivot, and ball-and-socket joints. Students learn where various bones fit by "trying them on." They discover the practical importance of joints when they attempt a game of soccer with splinted elbows and knees.

Live action, X rays, and medical footage help illustrate the relationship of bone and ligament, joint and tendon. Muscles contract and relax—shorten and lengthen. Of the three kinds of muscles—skeletal, smooth, and cardiac—two are shown to be involuntary: Only skeletal muscle is under voluntary control.



We encourage you to photocopy this teacher's guide.

## OBJECTIVES

After viewing the video and discussing the contents of the teacher's guide, students will be able to:

- identify the major bones of the body and describe how they protect and support the body;
- name three kinds of muscles in the body and describe their functions;
- explain how the composition of bone gives it both strength and lightness; and
- describe how bones, muscles, tendons, joints, and ligaments combine to create movement.

## VOCABULARY

**calcium:** a mineral component that makes bones hard.

**collarbone** (also called **clavicle**): one of a pair of bones that connect the shoulder blades to the spine.

**cardiac muscle:** the principal muscle tissue of the heart.

**cartilage:** A firm, elastic type of connective tissue found in ears, noses, and joints, cartilage provides a cushion that can absorb the impact of walking or lifting. Cartilage forms almost all of an embryo's developing skeleton, most of which gradually hardens into bone.

**compact bone:** dense, solid bone.

**involuntary muscle** (also called **smooth muscle**): a muscle—such as those in the stomach, bladder, or esophagus—that functions automatically and is not under voluntary control.

**ligament:** a tough, fibrous tissue that connects and supports bones.

**marrow:** the soft connective tissue that occupies the cavities in spongy bone. Yellow marrow consists mainly of fat cells. Red marrow contains little fat and is the site of red blood cell production.

**pelvis:** the basin-shaped structure at the base of the spine that protects the reproductive organs.

**rib:** one of the paired, curved bones attached to the spinal column that form the chest wall, which protects the viscera, or internal organs.

**shoulder blade** (also called **scapula**): It connects the **humerus** (the long bone of the upper arm) to the collarbone.

**skeletal muscle** (also called **voluntary muscle**): a muscle that is attached to the skeleton and is under voluntary control.

**skull:** the skeleton of the head, which protects the brain and supports the jaw, anchoring the teeth.

**spinal cord:** The spinal cord is a bundle of nerve tissue that transmits signals from the brain to the periphery and from the periphery and the organs back to the brain. These may be signals of pain, perception of movement, or orientation in space. Movement is coordinated through the spinal cord, and reflexes are transmitted through it.

**spongy bone:** lightweight, porous bone.

**tendon:** a band of dense, fibrous, connective tissue that attaches muscle to bone or cartilage.

**vertebra:** any of the 33 bones of the spinal column. The vertebrae protect the spinal cord and provide openings through which nerves exit. While we are born with 33 vertebrae—seven cervical, twelve thoracic, five lumbar, five sacral, and four coccygeal—as we develop, the sacral and coccygeal vertebrae normally fuse to become two bones, the coccyx and the sacrum. Thus, an adult's spine usually consists of 26 vertebrae.

## ACTIVITIES

**From screen to classroom:** Perform some of the same activities with your class that the teacher in the video performs with his class. For instance, have students "try on" various bones. (Perhaps a nearby high school or medical college will lend you a skeleton if your school doesn't have one.) Ask students to bring in some of their old clothes in order to show how much they've grown over the years. Tie splints to several students' arms and legs, then have them play a game of soccer or simply walk about the classroom.

**Making the connection:** Joints, the connections between bones, determine the direction and extent of bone movement. Some joints permit more movement than others. Have each student choose a joint to research, then report to the class on the type(s) of movement the joint allows. The class can then discuss what types of joints enable the head to move from side to side or an arm to bend, which type allows the greatest freedom of movement, and which is the most restrictive. Use a skeleton to demonstrate the various joints being discussed.

**Good sports:** Many people become painfully aware of their muscular and skeletal systems as a result of sports injuries. Some students might be able to report on injuries they, their friends, or members of their family have sustained; on what treatment was received; and on how well they recovered. Other students could choose an athletic activity and investigate the parts of the muscular and skeletal systems that are most

stressed by this particular activity. What types of injuries are most likely to occur? How are they treated? Students should report their findings to the class, using illustrations of the muscular and skeletal systems.

**Bones:** Bring in several bones from a butcher's shop so the class can see, feel, and compare compact bone, spongy bone, cartilage, and marrow.

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*Your Body: Muscular and Skeletal Systems*, produced by the National Geographic Society's Television Division: Timothy T. Kelly, *Senior Vice President and Director*; Sidney Platt, *Director, Educational Films*; Donald M. Cooper, *Associate Director*; Carl E. Ziebe, *Assistant Director*. For the teacher's guide: Donald M. Cooper, Elizabeth S. Wooster, *Editors*; Suzanne K. Poole, *Writer/Researcher*. Consultants: Elna M. Clevenger, *National Cathedral School, Washington, DC*; Lynn H. Gerber, M.D.; Suzannah Gerber.